Clean copy of the allowed claims

1. (Deleted).

2. An apparatus for verifying that a circuit specification describes a circuit exhibiting a property defined as a consequent behavior occurring during clock cycles 1 through N of a clock signal following an antecedent event, wherein N is an integer greater than 0, wherein the circuit responds to input signals by producing output signals, wherein the antecedent event is a first state change pattern in at least one of the input and output signals, and wherein the consequent behavior is production of a second. state change pattern in at least one of the output signals, the apparatus comprising:

a circuit simulator for implementing a simulated circuit, wherein the simulated circuit simulates the circuit described by the circuit specification, wherein the circuit simulator produces output waveform data representing time-varying behavior of the input and output signals and representing a current state of the simulated circuit;

detector means for detecting in the output waveform data an occurrence of a data pattern representing the antecedent event; and

means for generating a temporally expanded model of the simulated circuit based on the circuit specification and on a state of the circuit upon the occurrence of data pattern as indicated by the output waveform data, the temporally expanded model representing the circuit as a set of N circuit functions CKT_1-CKT_N, each corresponding to a separate one of the N clock cycles and each representing behavior of the circuit during its corresponding clock cycle.

3. The apparatus in accordance with claim 2 wherein the Kth circuit function CKT_K (for K = 1 to N) has a first input variable representing states of circuit input signals at a start of clock cycle K that influence the consequent behavior.

4. The apparatus in accordance with claim 3 wherein the Kth circuit function CKT_K (for K = 1 to N) has a second input variable representing states of circuit output signals at the start of clock cycle K that influence the consequent behavior.

5. The apparatus in accordance with claim 4 wherein the Kth circuit function CKT_K (for K = 1 to N-1) has a first output variable representing states of circuit output signals at an end of clock cycle K that influence the consequent behavior.

6. The apparatus in accordance with claim 5 wherein the Kth circuit function CKT_K (for K = 1 to N-1) has a second output variable representing states of any circuit output signals at the end of clock cycle K that are included in the second state change pattern.

7. The apparatus in accordance with claim 6 further comprising means for receiving and analyzing the second output variable of each of the circuit functions to verify whether the circuit exhibits the consequent behavior.

8. A method for verifying that a circuit specification describes a circuit exhibiting a property defined as a consequent behavior occurring during clock cycles 1 through N of a

clock signal following an antecedent event, wherein N is an integer greater than 0, wherein the circuit responds to input signals by producing output signals, wherein the antecedent event is a first state change pattern in at least one of the input and output signals, and wherein the consequent behavior is production of a second state change pattern in at least one of the output signals, the method comprising the steps of:

a. simulating behavior of the circuit described by the circuit specification to produce output waveform data representing time-varying behavior of the input and output signals and representing a current state of the simulated circuit;

b. generating a temporally expanded model of the simulated circuit based on the circuit specification and on a state of the circuit upon the occurrence of data pattern as indicated by the output waveform data, the temporally expanded model representing the circuit as a set of N circuit functions CKT_1-CKT_N, each corresponding to a separate one of the N clock cycles and each representing behavior of the circuit during its corresponding clock cycle.

9. The method in accordance with claim 8 wherein the Kth circuit function CKT_K (for K = 1 to N-1) has a first output variable representing states of circuit output signals at an end of clock cycle K that influence the consequent behavior.

10. The method in accordance with claim 9 wherein the Kth circuit function CKT_K (for K = 1 to N-1) has a second output variable representing states of any circuit output signals at the end of clock cycle K that are included in the second state change pattern.

11. The method in accordance with claim 10 further comprising the step of:

c. receiving and analyzing the second output variable of each of the circuit functions to verify whether the circuit exhibits the consequent behavior.

12. The method in accordance with claim 11 wherein the Kth circuit function CKT_K (for K = 1 to N) has a first input variable representing states of circuit input signals at a start of clock cycle K that influence the consequent behavior.

13. The method in accordance with claim 12 wherein the Kth circuit function CKT_K (for K = 1 to N) has a second input variable representing states of circuit output signals at the start of clock cycle K that influence the consequent behavior.

14. An apparatus for verifying that a circuit specification describes a circuit exhibiting a property defined as a consequent behavior following an antecedent event, wherein the circuit responds to input signals by producing output signals, wherein the antecedent event is a first state change pattern in at least one of the input and output signals, and wherein the consequent behavior is a second state change pattern in at least one of the output signals, the apparatus comprising:

a circuit simulator for implementing a simulated circuit, wherein the simulated circuit simulates the circuit described by the circuit specification, wherein the circuit simulator produces output waveform data representing time varying behavior of the input and output signals and representing a current state of the simulated circuit;

detector means for detecting in the output waveform data an occurrence of a data pattern representing the antecedent event;

means for generating a state space model of the simulated circuit representing states of the simulated circuit that are reachable from the current state of the simulated circuit represented by the circuit simulator output waveform data within a finite number of clock signal cycles after the detector means detects the data pattern representing the antecedent event; and

means for analyzing the state space model to verify the circuit exhibits the consequent behavior.

15. The apparatus in accordance with claim 14 wherein the circuit transitions between states only on edges of a periodic clock signal supplied as input thereto, and

wherein the consequent behavior occurs during the finite number of periods of the clock signal following the antecedent event.

16. The apparatus in accordance with claim 15 wherein the state space model represents only states of the simulated circuit that are reachable from the current state of the simulated circuit represented by the circuit simulator output data within the finite number of clock signal cycles after the detector means detects the data pattern representing the antecedent event.

17. A method for verifying that a circuit specification describes a circuit exhibiting a property defined as a consequent behavior following an antecedent event, wherein the

circuit responds to input signals by producing output signals, wherein the antecedent event is a first state change pattern in at least one of the input and output signals, and wherein the consequent behavior is a second state change pattern in at least one of the output signals, the method comprising the steps of:

simulating the circuit to produce waveform data representing successive state changes of the input and output signals and representing successive states of the circuit;

generating a state space model of the simulated circuit representing states of the simulated circuit that are reachable from the current state of the simulated circuit represented by the circuit simulator output waveform data within a finite number of clock signal cycles after the detector means detects the data pattern representing the antecedent event; and

analyzing the state space model to verify the circuit exhibits the consequent behavior.

18. The method in accordance with claim 17 wherein the circuit transitions between states only on edges of a periodic clock signal supplied as input thereto,

wherein the consequent behavior occurs during the finite number of periods of the clock signal following the antecedent event.

19. The method in accordance with claim 17 wherein the generated state space model includes only states of the circuit that are reachable from the current state of the circuit represented by the waveform data within the finite number of clock signal cycles after the waveform data represents the antecedent event.